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Disparities in colorectal cancer incidence among Latino subpopulations in California defined by country of origin

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Abstract

Purpose—In California, colorectal cancer (CRC) is the second most common cancer in Latinos. Using data from the California Cancer Registry we investigated demographic and clinical characteristics of 36,133 Latinos with CRC living in California during 1995–2011 taking into account subpopulations defined by country of origin.

Methods—Cases were defined as Latino according to the North American Association of Central Cancer Registries Hispanic Identification Algorithm, which was also used to group cases by country of origin: Mexico (9,678, 27%), Central or South America (2,636, 7%), Cuban (558, 2%), Puerto Rico (295, 1%), and other or unknown origin (22,966, 64%; Other/NOS). 174,710 non-Hispanic white (NHW) CRC cases were included for comparison purposes. Annual age-adjusted incidence rates (AAIR) and proportional incidence ratios (PIRs) were calculated.

Results—Differences were observed for age at diagnosis, sex distribution, socioeconomic status (SES), nativity (US- versus foreign-born), stage, and tumor localization across Latino subpopulations and compared to NHW. Mexican-Latinos had the lowest AAIR and Cuban Latinos had the highest. PIRs adjusted for age, SES, and nativity showed an excess of CRC males and female cases from Cuba, female cases from Puerto Rico and reduced number of female cases from Mexico.

Conclusions—Differences in cancer incidence patterns and tumor characteristics were observed among Latino subpopulations in California. These disparities may reflect differences in cancer determinants among Latinos; therefore, given that country of origin information is unavailable for a large proportion of these patients, greater efforts to collect these data are warranted.

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Keywords

Hispanics; Latinos; California; colorectal cancer

INTRODUCTION

Latinos are the largest and the fastest growing minority ethnic group in the US; with a population of 54 million they currently account for 17.1% of the US population (US Census Bureau, 2013). This proportion is predicted to increase to 25% by the year 2050. California is home to 14.7 million Latinos, who represent 38.4% of the population and 27% of the total US Latino population (US Census Bureau 2013). Among Latinos living in California 83% are of Mexican origin, 9.2% are from Central America, 2.3% are from South America, 1.5% are from Puerto Rico, 0.6% from Cuba, and 2.9% are of "other" Hispanic origin (e.g., Spain or Latinos for whom there is no information on country of origin)(US Census Bureau, 2013 American Community Survey).

Incidence rates of the leading cancers in Latinos tend to be lower than those in non-Hispanic whites (NHW). However, unlike NHWs, cancer is the leading cause of death among Latinos [1]. Even though colorectal cancer (CRC) is the second most common cancer in Latino men and women, with an estimated 10,700 US Latinos diagnosed in 2012, the incidence rates are 12% and 16% lower than those for NHW men and women in the US population, respectively [1]. CRC is the second and third most common cause of cancer death among Hispanic men and women, respectively [1]. In spite of the overall lower incidence rates when compared to NHW, Latinos are reported to be diagnosed with CRC at an earlier age, with more advanced disease and worse survival than NHW [2, 3]. Localized-stage disease, which is associated with improved CRC outcome, was reported to be less common among Latinos compared to NHW [4–6].

CRC incidence rates in US Latinos are generally higher than those reported for most Latin American countries [7], suggesting that changes in lifestyle, erosion of protective factors [8], and/or environmental risk factors present in the US contribute to increasing incidence CRC rates in Latino immigrants and their descendants. In understanding this, it is important to consider that Latinos are a highly heterogeneous group in terms of culture and racial composition, as this ethnic group is the result of generations of admixture of European immigrants, Amerindian ancestors, and Africans, with varying degrees across Latin America [9, 10]. The complexity of this heterogeneity is increased among US Latinos given the diverse origins of Latino immigrants and varying degrees of inter-mixing and acculturation patterns to US culture. Consistent with this heterogeneity, previous studies that aimed to capture the heterogeneity within Latinos in the US have reported cancer incidence patterns that are not uniform across US Latino subpopulations defined by country of origin using different approaches [6, 11, 12]. These differences in cancer risk within subgroups of Latinos may point to specific cancer risk factors among Latino subpopulations, and may help guide future cancer control strategies to reduce the impact of cancer in this growing minority population.

In this study we report the frequency of key demographic and clinical characteristics of Latinos with CRC living in California between 1995 and 2011, taking into account Latino subpopulations defined by country of origin (Mexican, Puerto Rican, Cuban, and South or Central American).

METHODS

Case identification

We used the cancer incidence data collected by the California Cancer Registry (CCR), from the October 2013 research file. Primary CRC cases diagnosed during 1995–2011 among Californian residents were identified by the Surveillance, Epidemiology, and End-Results Program (SEER) site codes (21041–21052), based on the site and histology codes as defined in the *International Classification of Diseases for Oncology, Third Edition* (ICD-O-3) [13]. Latino status and Latino subpopulations were identified by the NAACCR Hispanic Identification Algorithm (NHIA)[14]. This algorithm uses several NAACCR variables to classify individuals as Hispanic or non-Hispanic using information from Spanish/Hispanic Origin, last name, maiden name, birthplace, and race. It also allows to subgroup Hispanics into subpopulations defined by country of origin (birthplace). We assigned all Latino CRC cases to one of the following groups: Mexican, Puerto Rican, Cuban, South or Central American (any country from South or Central America and Caribbean except Cuba and Puerto Rico). Individuals of other specified countries of origin (e.g. Dominican Republic, Spain) as well as those individuals "not otherwise specified" due to missing birthplace information (NOS) were assigned to the category 'Other/NOS'. CRC cases of NHW were also included in the study for comparison.

The cases were further grouped by gender (males and females), age at diagnosis (five-year age groups, further grouped into <50, 50–65, and >65), socioeconomic status (SES) (low, middle, and high), nativity (US-born and foreign-born), vital status (alive and deceased). The SES was grouped based on the CCR's previously published area-based methodologies [15, 16] using census tract level SES information from Census 2000 and American Community Survey (ACS) 2007–2011 aggregated data. SES based on Census 2000 results was applied to cases diagnosed during 1995–2005, while the SES developed using the ACS data was applied to cases diagnosed during 2006–2011. Nativity (US versus foreign-born Latinos) was defined on reported country of birth. For 36% of Latino cases with unknown birthplace, nativity was estimated by using the individual's social security number (SSN), using an algorithm previously described [17]. Briefly, if the SSN was issued before age 25 years individuals were considered US born whereas those with SSN issued after age 25 years were considered foreign born.

The CRC cases were also characterized by tumor location and behavior (in situ and invasive) as defined in ICD-O-3, tumor size, and stage at diagnosis (stage I-IV). Tumor size records the largest dimension or diameter of the primary tumor in millimeters. Tumor stage at diagnosis was defined by the SEER-modified AJCC staging system.

Population

We estimated the age-gender-specific population at risk for the entire study period by using the 2000 census counts for the Latino population in California stratified by the corresponding subcategories as in the cases and multiplied by 11 for the 1995–2005 period, and counts from 2010 census multiplied by 6 for 2006–2011.

Statistical Analyses

Comparison of frequencies for these different variables across Latino subpopulations and with NHW were done using chi-square tests or Fisher exact tests, as appropriate. We calculated the age-adjusted (2000 or 2010 U.S. standard population) incidence rate (AAIR) by gender and racial/ethnic groups, per 100,000 population. We estimated proportional incidence ratios (PIRs) adjusting for age, gender, SES, and nativity for Latino subpopulations. The adjusted PIRs were estimated by first calculating the age-gender-SES-nativity-specific proportions of CRC cases among all cancer cases in the total Latino population during the study period. This proportion multiplied by the corresponding observed age-gender-SES-nativity-specific number of all cancer cases for each Latino subpopulation resulted in the expected age-gender-SES-nativity-specific number of CRC cases for each Latino supopulation. The expected total number of CRC cases for both genders for a given subpopulation group was obtained by the sum of all age-SES-nativity-specific expected number of CRC cases. Finally, the PIR is the ratio of the observed cases to those expected.

RESULTS

Between the years 1995 and 2011 there were 36,133 CRC cases (20,140 in 1995–2005 and 15,993 in 2006–2011) diagnosed in California identified as Latinos and 174,710 NHWs (117,720 in 1995–2005 and 56,990 in 2006–2011). Among those identified as Latino, 9,678 (27%) were identified to be of Mexican origin, 2,636 (7%) Central or South American, 558 (2%) Cuban, 295 (1%) Puerto Rican, and 22,966 (64%) were Latinos of other or unknown country of origin (Other/NOS) (Table 1). Regarding self-identified race, out of the total of 36,133 Latinos, 35,507 (98.3%) identified as white, 178 (0.5%) as black, 152 (0.4%) as other races combined, and 296 (0.8%) were of race unknown. The distribution of Latino subpopulations were very similar for the two periods considered: 1995–2005 and 2006–2011 (data not shown).

Demographic characteristics of Latino CRC cases in California

Table 1 summarizes the key demographic characteristics for all Latino cases and Latino subpopulation for the entire period of 1995–2011. As comparison, we also show the distribution of these characteristics for NHW. All Latinos combined showed a statistically significant higher proportion of cases diagnosed before 50 years old (16% in Latinos versus 7% in NHW, $p < 0.001$). We also observed statistically significant differences across subpopulations defined by country of origin ($p < 0.001$). Specifically, the proportion of cases diagnosed before age 50 was highest among Mexicans (20%) and Central/South Americans (20%), followed by Latinos NOS (15%) and Puerto Ricans (9%). Cubans showed proportions lower than those observed among NHW (4% versus 7%, respectively)

(Table 1). When we considered the two time periods included in these analyses, we observed that in the most recent period (2006–2011) there was a slight increase in individuals diagnosed under 50 years of age (17% vs 16% for 1995–2005) and those diagnosed between 50–65 years of age (38% vs 32% for 1995–2011); these differences were statistically significant ($p< 0.001$).

Overall, the proportion of female cases among Latinos was slightly lower than that of NHW (46% versus 49%, respectively). Among Latino subpopulations, Latinos from Mexico had the lowest proportion of females (43%) and Latinos from Central/South American had the reverse pattern than all other subpopulations, with a lower frequency of males (44% vs. 54–57% among all other subpopulations)($p<0.001$)(Table 1). The sex distribution did not vary significantly between the two time periods considered (data not shown).

Statistically significant differences were also observed for the distribution of cases across SES status levels, with Latinos having greater proportion of low SES (levels 1 and 2) than NHW (56% vs. 27%, $p <0.001$) (Table 1). Among Latinos, a greater proportion of low SES (levels 1 and 2) was observed among Mexicans (66%), followed by Latinos NOS (53%), Central/South Americans (51%), Cubans (49%) and Puerto Ricans (46%) ($p <0.001$). Results did not differ significantly across the two periods considered (data not shown).

Nativity information was unknown for 36% of Latinos and was therefore imputed. Among all Latino cases combined, 53% were reported to be US born. There was a wide range of variation across the different subpopulations. Whereas among Latinos of Mexican origin 16% were US born, only 1% of South/Central American Latinos were US born. Among Puerto Ricans 11% were US born, and 3% among Cubans. The majority of Latinos of other or unknown origin were US born (77%).

The proportion of deceased patients within this time period was lower in Latinos compared to NHW (51% vs 60%, $p<0.001$); however, within Latino subpopulations Cubans had the highest proportion of deceased patients (63%) among all Latinos and also compared to NHW, followed by Puerto Ricans (58%). In contrast, Central/South Americans had the lowest proportion of deceased patients (44%). The observed differences within Latino subpopulations were statistically significant ($p<0.001$).

Clinical characteristics of Latino CRC cases in California

When comparing all Latino cases to NHW, no statistical differences were observed for the distribution of carcinoma in situ (CIS) versus malignant tumors ($p = 0.084$)(Table 2). However, differences were observed across Latino subpopulations, with Puerto Ricans having a slightly greater proportion of CIS (7%) than other subpopulations (4–5%; $p<0.001$).

Differences were also observed in tumor stage distribution, with Latinos showing a slightly higher proportion of stage IV tumors than NHW (20% in Latinos, versus 18% in NHW) ($p<0.001$). Moreover, differences were observed across Latino subpopulations with Latinos of Mexican origin having the highest proportions of Stage IV tumors (23%) and Latinos from Cuba having the lowest (16%)($p<0.001$)(Table 2).

Latinos had a statistically significant higher proportion of rectal cases than NHW (33% versus 28%, p<0.001). Within Latino subpopulations, Mexicans (35%) had the highest proportion of rectal cancer, followed by Latinos of Other/NOS origin (32%) and South/Central American Latinos (31%), whereas Cuban Latinos had much lower proportion of rectal cancer (23%)(p<0.001). Latinos also showed slightly higher proportion of larger tumors (>50 mm) than NHW (35% versus 31%, p<0.001). Among Latino subpopulations Latinos from Mexico had a significantly higher proportion of tumors larger than 50 mm (39%), followed by South/Central American Latinos (36%), whereas Latinos from Puerto Rico had the lowest proportion (30%)(p<0.001) (Table 2).

CRC incidence among Latinos in California

The age-adjusted incidence rate (AAIR) for all Latinos of in situ and invasive cancers combined was 47.2/100,000 in men and 31.6/100,000 in women. These rates were 20% and 26% lower than the corresponding rates for NHW for the same period, which were 58.7/100,000 and 43.6/100,000 for men and women, respectively. When we calculated AAIRs specifically for each Latino subpopulation, we observed considerable heterogeneity in CRC incidence rates among Latino subpopulations (Supplementary Table 1). AAIRs of most Latino subpopulations were lower than the AAIR for all Latino combined. For example, the incidence rate among Latino men and women of Mexican origin was only ~one-third of the rates among all Latinos combined, respectively. In contrast, the incidence rate among Latino men and women of Cuban origin was only 8% and 15% lower than the one for all Latinos combined for men and women, respectively.

Given that there might be differences in how the numerator (cancer cases counts from CCR) and denominator (population counts from census) identified the different Latino subpopulations, this can lead to biased AAIR estimates. To address this, we estimated adjusted proportional incidence ratios (PIRs), which allowed us to determine if the observed number of CRC cases reported for each Latino subpopulation were comparable to the number of cases we expect to see given the proportion of CRC cases among all Latinos in California with respect to all cancer cases, and the total counts of cancer cases who belong to each Latino subpopulation. Given the observed statistically significant differences in age, sex, SES and nativity status distribution by Latino subpopulations, we estimated PIRs adjusting for these four variables to determine if any disparities would be observed when accounting for these important predictors of cancer incidence (Table 3). Among men, we found an excess of CRC cases from Cuba (PIR = 127; 95% CI = 114–141) and a non-statistically significant reduced number of cases from Mexico (PIR = 97; 95% CI = 95–100). Among females, we also observed an excess of CRC cases from Cuba (PIR = 183; 95% CI = 124–156), Puerto Rico (PIR = 113; 95% CI = 104–142), and for Latinos of other or unknown origin (PIR = 104; 95% CI = 102–106); and reduced number of cases from Mexico (PIR = 89; 95% CI = 87–92)(Table 3).

DISCUSSION

In this study we report that when considering subpopulations of Latinos defined by country of origin some important disparities emerge regarding the pattern of incidence. Specifically,

we observed that compared to NHW and other Latino subpopulations, Latinos from Mexico have a greater proportion of males compared to females, diagnosis at a younger age, stage IV cases, and rectal cancer cases. In contrast, compared to NHW and other Latino subpopulations, Latinos from South/Central America had higher proportion of females compared to males, and Latinos from Cuba had lower proportion of stage IV cases and lower proportion of rectal cases. Overall, among the considered Latino subpopulations, Mexican Latinos had the lowest observed incidence rates whereas Cuban-Latinos had the highest. When adjusting for SES and nativity fewer CRC cases were observed than expected among Mexican Latinos, whereas there was an excess of CRC cases among Cuban and Puerto Rican Latinos.

In agreement with our findings, a previous study based on SEER and Center for Disease Control National Program of Cancer Registries data reported PIRs that showed that compared to NHW, Mexican-Latinos and Latinos of South or Central American origin had slightly lower proportion of CRC, whereas Puerto Rican-Latinos had slightly higher proportion of CRC and Cuban Latinos had comparable proportion of CRC as NHW [12]. However, PIRs in that study were only adjusted for age, and not SES and nativity as we did in this study. A follow-up study used an indirect method that used US Census county demographic data to allocate Latinos at the aggregate level to subpopulations defined by country of origin, using these subpopulation-specific case counts to estimate AAIRs [6]. That study reported that whereas all Latinos combined had a colon cancer incidence lower than the incidence for NHW, Latinos of Cuban origin had higher colon cancer incidence than NHW, and those of Puerto Rican origin had an incidence that was still slightly lower than NHW, yet higher than those of Mexican origin or all Latinos combined [6]. Similar differences were observed for rectal cancer, although none of the incidence rates were higher than those for NHW. In another study, using individual level data, comparable observations were made for Latinos living in Florida, with Latinos of Mexican origin showing lower incidence rates than NHW in Florida whilst Puerto Ricans and Cubans living in Florida had higher CRC incidence rates than Florida NHW, with the difference being more pronounced for Cuban women [11]. In our study we did not observe that any subpopulation had incidence rates higher than NHW; however, similar to these previous reports, we observed that Cubans and Puerto Ricans had many more cases than expected, whereas Mexicans had fewer, and that the excess of cases for Cubans was greater for women than men.

Given that in the CCR more than 60% of Latinos cases were of unknown country of origin information, the subpopulation AAIRs underestimate the true incidence rate for each group. Moreover, our analyses show that most Latinos of unknown country or origin are US born (77%), and we do see differences in the proportion of US born versus foreign born Latinos across subpopulations. Hence, the missing birthplace data might be greater for some Latino subpopulations such as Latinos from Mexico or Puerto Rico than Latinos from Cuba and Central/South America. This may explain, at least partially, the lower AAIRs for Latinos from Mexico and Puerto Rico when compared to the AAIRs of all Latinos combined. Therefore, these AAIRs estimates illustrate the challenges presented by the missing birthplace data for Latinos, and should be interpreted with caution.

Due to these concerns with AAIRs, and in light of the missing birthplace data, we think that the comparisons across subgroups using PIRs currently offer more accurate insights into possible CRC disparities within Latinos in California. When estimating PIRs, we take the proportion of CRC cases for all Latinos, and apply this proportion to the total counts for all cancers for each Latino subpopulation, taking into account age, sex, SES and nativity strata, and we take this to be our expected number of CRC cases for that subpopulation. Any statistically significant deviations from this number would indicate that there are more or fewer CRC cases in that subpopulation and this would be suggestive of disparities within Latinos in California. Even if under-reporting of birthplace were indeed differential by country of origin, we speculate this to be the case for any cancer, not just colorectal cancer. Therefore, the fact that we see differences in PIRs among subpopulations suggests that the disparities we see are unlikely to be due just by differences in nativity status and perhaps due to other risk determinants that are different across Latino subpopulations. Specifically, our conclusion based on PIRs showed a lower number of CRC cases from Mexican-Latinos than expected, and higher number of CRC cases from Puerto Rican Latinos and Cuban Latinas. These observed disparities deserve further investigation.

Among Latinos in California, higher SES is associated with higher incidence of CRC compared to lower SES [16]. Cuban and Puerto Rican Latinos in California have a significantly higher proportion of high SES cases than Mexican Latinos, which could be speculated to account for the observed higher proportion of CRC cases in these two subpopulations compared to other subpopulations. However, PIR estimates were adjusted for SES so this is unlikely to be the only explanation for the observed differences in proportions across subpopulations. Another difference between these two subpopulations of Latinos compared to Mexican Latinos is the fact that Latinos from the Caribbean have on average a greater proportion of African ancestry and reduced proportion of Indigenous American ancestry [18, 19]. It could be speculated that these differences in genetic background may contribute to differences in genetic susceptibility to environmental risk factors. Further studies need to be done to understand the possible sources of the observed differences in cancer incidence.

We observed that Latinos overall had a slightly greater proportion of advanced stage, with Mexican-Latinos having the greatest proportion. Latinos in general are reported to have lower rates for CRC screening (47%) compared to NHW (59%), and Latinos who live in mostly Latino neighborhoods have been reported to be more likely to be diagnosed with more advanced disease [2, 4–6]. Also, CRC screening has been reported to vary among US Latinos by English proficiency and by country of origin, with Mexican-Latinos being reported to have a lower rate of any type of CRC screening compared to Cuban- or Puerto Rican-Latinos [6, 20–23]. These findings are in agreement with the observed stage distributions in our study.

Our observation of a greater proportion of Latinos being diagnosed at younger age, is consistent with previous reports [24]. Among Latino subgroups in California we observed differences in the age population structure, with Cubans having a greater older population and Mexicans having the largest younger population. These differences in age population structure, along with increasing CRC rate due to recent westernization in some of these

subpopulations may partially explain the younger age at diagnosis. Moreover, this may be partially explained by possible genetic susceptibility factors that may predispose this population, and or higher exposure to CRC risk factors and/or loss of protective factors, and likely, a combination of genetic and environmental factors. Future studies on birth cohort effect and genetic susceptibility variants among Latinos will help elucidate these observations.

Strengths of our study include the use of population-based data from a SEER registry, which includes a wide range of SES, age at diagnosis, and countries of origin for Latinos living in California, which is the state with the largest number of Latinos in the US. A further strength is the use of a validated algorithm to identify most Latinos diagnosed with CRC in California [14]. The main weakness of our study is the missing country of origin information for more than 60% of cases. These missing data prevent us from estimating accurately the incidence rates of CRC among Latino subpopulations and raise the concern that differential underreporting may contribute to the observed disparities in rates. However, as explained above, our approach to estimate PIRs mitigates this concern and suggests that there are differences in the observed number of CRC cases across Latino subpopulation when compared to those expected based on the distribution of all cancer cases in California. Whether these differences are due to intrinsic characteristics of each Latino subpopulations, such as genetic ancestry, or due to lifestyle characteristics and environmental exposures, and/or a complex interplay between all of these factors, deserves further investigation. Moreover, we cannot discard the possibility that PIRs may not be accurate if, for example, one or more of the subpopulations had a significantly larger number of cases of a specific cancer, which would impact the proportion of CRC with respect to all cancers, an thus affect the accuracy of our PIR estimates. Therefore, to more accurately estimate cancer incidence rates and understand tumor characteristic disparities across Latino subpopulations with even higher numbers it will be of high importance to improve the collection of country of origin data on Latino patients, in order to reduce the impact and possible biases introduced by missing data. It is feasible that US born Latinos because of higher acculturation might be less likely to report country of origin of their family, and physicians perhaps less likely to inquire about this, contributing to missing data in the reports made to the cancer registry. Another limitation is the fact that even though we used an established algorithm to impute missing nativity (foreign born vs. US-born), we cannot discard the possibility of misclassification. Finally, another weakness of our study is that we did not have adequate numbers to subdivide patients from Central and South American origin and thus had to study them together, which is not ideal as there are disparities in CRC incidence across Central and South American countries.

In summary, our study reports disparities in cancer incidence patterns and several demographic and clinical characteristics across Latino subpopulations defined by country of origin in California. These findings highlight the importance of taking into account the heterogeneity within Latino populations and the importance of improving the collection of data on country of origin in order to understand further the underlying causes of the observed differences. Given that currently cancer is the number one cause of death among Latinos, understanding the patterns of incidence and presentation in this population with more precision is of high public health relevance.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Frequency of demographic characteristics for CRC cases diagnosed between 1995–2011 in California

	All Latinos N = 36,133		Mexican N = 9678		Puerto Rican N = 295		Cuban N = 558		Central/South American N = 2636		Other/NOS Latinos N = 22966		NH white N =174710	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Age at DX														
<50	5,839	16	1,900	20	27	9	24	4	515	20	3,373	15	12,238	7
50–65	12,496	35	3,464	36	90	31	118	21	970	37	7,854	34	44,899	67
>65	17,798	49	4,314	44	178	60	416	75	1,151	43	11,739	51	117,573	26
Gender														
Females	16,559	46	4,204	43	137	46	254	46	1,481	56	10,482	46	84,947	49
Males	19,574	54	5,474	57	158	54	304	54	1,155	44	12,483	54	89,763	51
Birth Place														
US	19,241	53	1,565	16	33	11	14	3	28	1	17,601	77	145,055	83
Foreign born	15,826	44	8,040	83	260	88	544	97	2,596	98	4,386	19	26,501	15
Unknown	1,066	3	73	1	2	1	0	0	12	1	979	4	3,154	2
SES														
Low (1,2)	20,310	56	6,410	66	137	46	273	49	1,346	51	12,144	53	47,815	27
Medium (3)	7,068	20	1,628	17	64	22	118	21	506	19	4,752	21	39,251	22
High (4,5)	8,755	24	1,640	17	94	32	167	30	784	30	6,070	26	87,644	51
Vital Status														
Alive	17,746	49	4,661	48	123	42	204	37	1,485	56	11,914	52	69,682	40
Deceased	18,387	51	5,017	52	172	58	354	63	1,151	44	11,052	48	105,028	60

Table 2

Frequency of tumor characteristics for CRC cases diagnosed between 1995–2011 in California

	All Latinos N = 36,133		Mexican N = 9678		Puerto Rican N = 295		Cuban N = 558		Central/South American N = 2636		Other/NOS Latinos N = 22,966		NHW N = 174,710	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Behavior														
CIS	1,709	5	378	4	21	7	26	5	99	4	1,185	5	8,640	5
Malignant tumor	34,424	95	9,300	96	274	93	532	95	2,537	*96*	21,781	95	166,070	95
Stage														
With stage information	*32699*	*90*	*8,551*	*88*	*274*	*93*	*516*	*92*	*2,385*	*90*	*20,973*	91	*160,748*	92
In Situ	2,890	9	608	7	30	11	47	9	179	8	2,026	10	13,879	9
Stage I	7,079	22	1,559	18	53	19	111	22	462	19	4,894	23	39,524	25
Stage II	8,344	25	2,251	26	72	26	147	28	648	27	5,226	25	43,012	27
Stage III	7,958	24	2,199	26	62	23	127	25	625	26	4,945	24	36,140	22
Stage IV	6,428	20	1,934	23	57	21	84	16	471	20	3,882	19	28,193	18
Unstaged	*3,434*	*10*	1,127	*12*	21	*7*	42	*8*	251	*10*	1,993	9	13,962	8
Tumor Size (mm)														
With size information	*25841*	*72*	*6755*	*70*	*220*	*75*	*429*	*77*	*1957*	*74*	*16480*	*72*	*126967*	73
microscopic focus/foci	508	2	105	2	3	1.4	8	2	35	2	357	2	2549	2
<50	16265	63	4000	59	151	68.6	279	65	1214	62	10621	64	84811	67
50–100	9036	35	2643	39	66	30.0	142	33	707	36	5478	33	39505	31
>100	32	0.1	7	0.1	0	0	0	0	1	0.1	24	0.1	102	0.1
Multiple polyposis	43	0.2	27	0.4	0	0	0	0	2	0.1	14	0.1	101	0.1
Unknown size	*10249*	*28*	*2896*	*30*	*75*	*25*	*129*	*23*	*677*	*26*	*6472*	*28*	*47642*	*27*
Tumor Site														
Colon	*24251*	*67.1*	*6267*	*64.8*	*212*	*71.9*	*426*	*76.3*	*1818*	*69*	*15528*	*67.6*	*126403*	*72.4*
Appendix	490	2	172	3	4	2	5	1	34	2	275	2	2,049	2
Ascending Colon	3,846	16	957	15	35	17	82	19	323	18	2,449	16	21,419	17
Cecum	5,118	21	1,232	20	54	25	86	20	394	22	3,352	22	29,399	23
Colon, NOS	1,017	4	438	7	11	5	14	3	73	4	481	3	5,587	4
Hepatic Flexure	1,283	5	329	5	13	6	30	7	83	5	30	0	7,058	6
Sigmoid Colon	8,222	34	2,081	33	59	28	107	25	588	32	5,387	35	35,810	28

	All Latinos N = 36,133		Mexican N = 9678		Puerto Rican N = 295		Cuban N = 558		Central/South American N = 2636		Other/NOS Latinos N = 22,966		NHW N = 174,710	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Splenic Flexure	738	3	197	3	5	2	14	3	56	3	466	3	4,546	4
Transverse Colon	1,899	8	451	7	14	7	53	12	160	9	1,221	8	11,960	9
Overlapping lesion of Colon	237	1	55	1	3	1	0	0	24	1	-	0	1,327	1
Descending Colon	*1401*	*5.78*	*355*	*5.66*	*14*	*6.6*	*35*	*8.22*	*83*	*4.57*	*914*	*5.89*	*7248*	*5.73*
Rectum	*11860*	*32.8*	*3401*	*35.1*	*83*	*28.1*	*132*	*23.7*	*818*	*31*	*7426*	*32.3*	*48169*	*27.6*
Rectosigmoid Junction	3,150	27	870	26	18	22	34	26	183	22	2,045	28	13,900	29
Rectum, NOS	8,710	73	2,531	74	65	78	98	74	635	78	5,381	72	34,269	71
Intestinal tract, NOS	*22*	*0.06*	*10*	*0.1*	*0*	*0*	*0*	*0*	*0*	*0*	*12*	*0.05*	*138*	*0.08*

The proportion of cases by stage and tumor size were calculated using as denominator the total number of cases with the relevant information available. The proportion of cases by tumor site in the colon or rectum were calculated using as denominator the total number of cases localized in the colon or rectum, neither count included cases with tumor site to the intestinal tract, no otherwise specified (NOS).

Table 3

Adjusted proportional incidence ratios (PIRs) for Hispanic subcategories

		Adjusted for age, SES and nativity		
	Cases	**Expected Cases**	**100%PIR**	**95% CI**
Males by country of origin				
Mexican	5,474	5,636	97	95–99.6
Cuban	304	239	127	114–141
Puerto Rican	158	150	105	91–121
South/Central American	1,155	1,176	98	93–104
Other/NOS Latinos	12,483	12,372	101	99–103
Females by country of origin				
Mexican	4,204	4,707	89	87–92
Cuban	254	183	139	124–156
Puerto Rican	137	113	121	104–142
South/Central American	1,481	1,446	102	98–108
Other/NOS Latinos	10,483	10,110	104	102–106